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## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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| **In the application of** | : | John Paul Russell |
| **Serial No.** | : | 09/166,814 |
| **Filed** | : | October 6, 1998 |
| **For** | : | Concatenation of Containers In Synchronous Digital Hierarchy Network |
| **Examiner** | : | Phuc H Tran |
| **Art Unit** | : | 2666 |
| **Customer number** | : | 23644 |

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to, Commissioner for Patents, P.O. Box 1450, Alexandria, VA, 22313-1450 on December 1, 2004
Name of person signing Minnie McBride
Signature Minnie McBride

## APPEAL BRIEF

Honorable Director of Patents and Trademarks
PO Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This appeal is from the final rejection of August 3, 2004. A timely notice of appeal was filed October 5, 2004 (mailed October 1), and the brief fee of $340 pursuant to 37 C.F.R. §41.20 is submitted herewith.

### i. Real Party in Interest

This application is assigned to Northern Telecom Limited, which by change of name is now Nortel Networks Limited. The assignment is recorded at Reel 010114, Frame 0955.

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## ii. Related Appeals and Interferences

These are no related appeals or interferences.

## iii. Status of Claims

The application was filed with claims 1 through 29. During prosecution, claims 1, 2, 4 to 11, 13 to 18, 22, 26 and 29 have been amended at least once, claims 30 to 36 added, claims, 12, 19, 27 and 28 retained as originally filed, and claims 3, 30 and 31 cancelled. Consequently, it is the rejection of claims 1, 3 to 29, 32 and 33-36 that is being appealed. The claims as currently pending are set forth in the Claims Appendix.

## iv. Status of Amendments

By an Amendment filed concurrently, claim 3, which had been intended to be cancelled, is now cancelled. No other amendments have been filed following the final Office Action dated July 29, 2004.

## v. Summary of the Claimed Subject Matter

The present invention relates to what is termed "virtual concatenation" of data transmitted over synchronous digital networks such as SONET and SDH networks. The present invention provides methods and apparatus for processing data at both the transmitter side and receiver side of the synchronous digital network. Thus, for example, independent method claim 1 and independent apparatus claim 13 enable the preparation of data for transmission over a synchronous digital network, whereas independent method claim 22 and independent apparatus claim 29 enable the recovery of data, for example, after transmission over a synchronous digital network.

Referring to the method claims, for example, at the transmitter side, the method of the present invention comprises the steps of generating a plurality of virtual containers to be transmitted over a synchronous digital network at a lower bit rate than the bit rate of the data to be transmitted, associating the plurality of virtual

containers with each other by means of inputting association data into the plurality of virtual containers and inputting the actual data to be transmitted into payloads of the plurality of virtual containers. By "splitting up" the data to be transmitted into a plurality of virtual containers having a lower bit rate, and by associating the plurality of virtual containers together, the present invention enables data having an incompatible data rate to be transmitted more efficiently over the synchronous digital network. By using association data in the plurality of virtual containers, the data transmitted may be recovered as set out in independent method claim 22 and independent apparatus claim 29, for example.

In some embodiments of the present invention, by inputting association data in overheads or path overheads of the plurality of virtual containers, efficiency is improved further since no payload data of the plurality of virtual containers needs to be displaced by the association data. See for example page 16, lines 4 to 5 of the description of the present invention. Furthermore, unlike a prior art approach in which data is introduced periodically in the actual data to be transmitted - i.e. payload data, no additional mechanisms are required at the receiver side for differentiating between the actual data to be transmitted and the association data. This is because the differentiation is implicit in the synchronous digital network forming mechanism which differentiates between path overheads and payloads of the plurality of virtual containers.

In other embodiments of the present invention, data indicating a time at which each virtual container was generated relative to other associated virtual containers is incorporated over several virtual containers. See for example page 15 line 8 to 11 of the description of the present invention. Thus, variable differential delays between the arrival of virtual containers can be accommodated.

## vi. Grounds of Rejection to be Reviewed on Appeal

The following issues are presented:-

1. The rejection of claims 1 to 3, 5 to 8, 10, 12 to 14, 16 to 20, 22, 24 to 26, 28, 29, 32 and 35 under 35 USC §102(e) as being anticipated by Saijonmaa et al (US patent no. 5,706,285);
2. The rejection of claims 4, 15, 23 and 27 under 35 USC §103(a) as being unpatentable over Saijonmaa et al in view of Oksanen et al (US patent no. 5,666,351); and
3. The objection to claims 11 and 21 for failing to particularly point out and distinctly claim the subject matter.

**vii. Argument**

Referring to Issue 1, Saijonmaa does not teach the feature that association data is input into or read from overheads or path overheads of a plurality of virtual containers as required in claims 1 to 29, 35 and 36. What Saijonmaa does teach is the introduction of overhead bytes $OH_1$ - $OH_N$ in front of cell blocks CB for various purposes (see column 5, lines 3 to 7 and 34 to 37, as well as figures 3 and 4). Each cell block CB comprises N consecutive cells $C_1$ - $C_N$ and N overhead bytes $OH_1$ - $OH_N$. The signal generated is multiplexed into N separate transmission signals of length (L+1) comprising bytes $B_1$ - $B_L$ and the respective overhead byte $OH_1$ - $OH_N$ (see particularly the right hand side of figure 3). Since the system of Saijonmaa is principally concerned with the transfer of ATM signals, L is typically chosen to be 53 to correspond to the length of an ATM cell. The N separate transmission signals are then output to a plesiochronous network or SDH network at a data rate of 2 Mbit/s. Thus, in the case of standard ATM cells where L is 53 bytes "the overhead byte OH occurs in the transmission signal at intervals of 54 bytes" (see column 5, lines 29 to 31).

The following observations can be made:

1. The teaching of Saijonmaa is that overhead bytes $OH_1$ - $OH_N$ are included in the N transmitted signals at intervals of L bytes. One skilled in the art would understand this to clearly indicate that the overhead bytes $OH_1$ - $OH_N$ are

included in the <u>payload</u> of a plurality of N virtual containers of a synchronous digital network, when the teaching of Saijonmaa is applied to such a network.

2. The overhead bytes $OH_1$ - $OH_N$ are a specific feature taught in Saijonmaa and are <u>not</u> in any way equivalent to the conventional overheads of synchronous digital networks.

3. As a result of introducing the overhead bytes $OH_1$ - $OH_N$, the efficiency of Saijonmaa is reduced compared to that of the present invention. For example, in the case of standard ATM cells, at least one byte in every 54 bytes of each of the N transmission signals is an overhead byte resulting in a reduction in efficiency of nearly 2%.

4. An extra mechanism is required at the receiver to facilitate cell synchronization - i.e. to enable the receiver to differentiate between overhead bytes $OH_1$ - $OH_N$ and cells $C_1$ - $C_N$. To achieve this, Saijonmaa teaches the addition of a resynchronization word F at intervals of one cell block CB in each of the individual transmission signals (see column 5, line 51 to column 6, line 3). This reduces even further the efficiency of the system of Saijonmaa as compared to the present invention. In an example given at column 6, lines 4 to 8, the resynchronization word F represents an extra overhead of about 2.3%.

The test of anticipation is a rigorous test requiring strict identity between the features of the claims and the allegedly anticipating prior art reference. One skilled in the art would clearly see that there is simply no disclosure of inputting association data in or reading association data from <u>overheads</u> or <u>path overheads</u> of the plurality of <u>virtual containers of a synchronous digital network</u>. The teaching of Saijonmaa that N overhead bytes $OH_1$ - $OH_N$ are introduced in front of cell blocks CB is clearly not identical to the requirements of the claims. Accordingly, claims 1 to 29, 35 and 36

are clearly novel over Saijonmaa and the rejection of claims 4, 15, 23 and 27 under 35 USC 103(a) as being unpatentable over Saijonmaa in view of Oksanen cannot be sustained.

Regarding claim 32, Saijonmaa does not teach that data indicating a time at which each virtual container was generated relative to other associated virtual containers is incorporated over several virtual containers. The Examiner has never suggested that Saijonmaa teaches this feature. Saijonmaa teaches that $OH_1$ - $OH_N$ are introduced in front of cell blocks CB for "various purposes". However, the only purposes actually described are a) "maintaining a serial count of the cell blocks CB" and "numbering the transmission signals" (see column 5 lines 34 to 50). The teaching of maintaining a serial count of the cell blocks CB further states that "[the] serial count is incremented by one or by N from one cell block to another, and it maintains the cell and cell block synchronization in the different transmission signals" (column 5 lines 37 to 39). Recall that N represents the number of transmission signals used and is therefore fixed. There is no teaching of incorporating data indicating a time at which each virtual container was generated relative to other associated virtual containers. Accordingly, claim 32 is not anticipated by Saijonmaa.

The Examiner's continued rejection of dependent claims 2 (3 having been cancelled) 5 to 8, 10, 12, 14, 16 to 20, 24 to 25, 28 and 33 to 36 is therefore moot in view of the above.

Turning to Issue 2, the Examiner's rejection of claims 4, 15, 23 and 27 is therefore also moot in view of the above.

Referring to Issue 3, applicants do not understand why the recitation of "a K3 byte of each virtual container" is failing to particularly point out and distinctly claim the subject matter. The Examiner had already indicated in the Office Action dated July 24, 2003, that claims 11 and 21, which refer to the K3 byte, contained allowable

subject-matter. The K3 byte is well-known to those skilled in the art of synchronous digital networks as being a particular field in the path overhead of virtual containers. For example, the G.707 standard as of March 1996 describes "the K3 byte" in several places. One skilled in the art would clearly be expected to be aware of the contents of this standard which prescribes the structure of SDH virtual containers. If the Examiner is unfamiliar with the standard, a copy can be submitted. Applicants believe that no correction is required.

Accordingly, it is respectfully submitted that the continued rejection of the pending claims cannot be sustained and reversal of the Examiner is therefore requested.

November 30, 2004

Respectfully submitted,

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## CLAIMS APPENDIX

1. A method of transporting data preparing data for transmission over a synchronous digital network, said method comprising the steps of:

generating in parallel a plurality of synchronous virtual containers, each to be transmitted over said synchronous digital network at a lower bit rate than a bit rate of said data to be transmitted, each said virtual container having a payload section and a path overhead section;

associating said plurality of virtual containers with each other by means of inputting assigning association data describing said association into said path overheads of said plurality of virtual containers; and

inputting said transported data to be transmitted into said payloads of said plurality of virtual containers; and

outputting said plurality of associated virtual containers onto a synchronous digital network.

2. The method as claimed in claim 1, wherein said plurality of associated virtual containers are transmitted over output onto said synchronous digital network substantially in parallel.

4. The method as claimed in claim 1, wherein said step of inputting said transported data to be transmitted into said payloads of said plurality of virtual containers comprises byte interleaving bytes of a frame of said transported data to be transmitted between said plurality of payloads.

5. The method as claimed in claim 1, wherein said plurality of virtual containers are generated as a plurality of streams of virtual containers and said step of associating said plurality of virtual containers with each other comprises associating a plurality of said plurality of streams of virtual containers with each other.

6. The method as claimed in claim 1, wherein said plurality of virtual containers are generated as a plurality of streams of virtual containers, and said step of associating said plurality of virtual containers together by means of assigning inputting association data comprises adding inputting [[a]] stream [[of]] identification data to each said virtual container, said steam identification data identifying which of said plurality of streams said virtual container belongs to.

7. The method as claimed in claim 1, wherein said plurality of virtual containers are generated as a plurality of streams of virtual containers and said step of associating said plurality of virtual containers together by means of assigning inputting association data comprises including inputting [[a]] sequence identification data to individual ones of each said plurality of virtual containers, said sequence identification data designating a sequence in which said individual virtual containers are generated with respect to each other.

8. The method as claimed in claim 7, wherein said plurality of virtual containers are generated as a plurality of streams of virtual containers and said step of associating said plurality of virtual containers together by means of assigning association data comprises assigning to individual ones of said plurality of virtual containers a sequence identification data comprising comprises a cyclically repeating code data.

9. The method as claimed in claim [[1]] 8, wherein said plurality of virtual containers are generated as a plurality of streams of virtual containers and said step of associating said plurality of virtual containers together by means of assigning association data comprises assigning to individual ones of said plurality of virtual containers a cyclically repeating code sequence having has a repetition period of at least 2 N+1, where N is the repetition number of sequentially received virtual

container payloads in a single stream. number of frames generated in a period of time equivalent to a maximum differential delay expected between virtual containers.

10. The method as claimed in claim 1, wherein the said plurality of virtual containers are generated as a plurality of virtual container streams and said step of associating said plurality of virtual containers together by means of assigning association data comprises utilizing a path trace byte in a virtual container overhead as a stream identifier data for identifying a virtual container as belonging to a particular said virtual container stream. The method as claimed in claim 6, wherein said stream identification data is input into a path trace byte of each said virtual container.

11. The method as claimed in claim [[1]] 7, wherein a said plurality of virtual containers are generated as a plurality of streams of virtual containers and said step of associating said plurality of virtual containers together by means of assigning association data bytes comprises including a sequence identification data in individual ones of said plurality of virtual containers, said sequence identification data designating a sequence in which said individual virtual container is generated within a said stream of virtual containers, said sequence identification data being carried within a K3 byte of an overhead section of said virtual container. is input into a K3 byte of each said virtual container.

12. The method as claimed in claim 1, wherein said plurality of virtual containers are generated as a plurality of streams of virtual containers and said step of associating said plurality of virtual containers together by means of assigning association data comprises assigning to individual ones of said plurality of virtual containers a sequence identification data comprising a code data extending over a plurality of said virtual containers of a said stream, for identifying a position of each said virtual container within said virtual container stream.

13. Apparatus for incorporating data input at a first data rate into a plurality of streams of synchronous digital hierarchy virtual containers each output at a second data rate, said apparatus comprising:

means for continuously generating a plurality of virtual containers in parallel;

means for generating data describing an association of said plurality of virtual containers, and for assigning said association data to said plurality of associated virtual containers; and

means for inserting said first data rate data into said plurality of payloads of said plurality of virtual containers. Apparatus for preparing data for transmission over a synchronous digital network, said apparatus comprising:

a virtual container generator arranged to generate in parallel a plurality of synchronous virtual containers, each to be transmitted over said synchronous digital network at a lower bit rate than a bit rate of said data to be transmitted, each said virtual container having a payload section and a path overhead section;

a virtual container associator arranged to associate said plurality of virtual containers with each other by means of inputting association data into said path overheads of said plurality of virtual containers; and

a data inputter arranged to input said data to be transmitted into said payloads of said plurality of virtual containers.

14. A method of recovering data from a plurality of synchronous virtual containers received over a synchronous digital network, said method comprising the steps of:

receiving said plurality of virtual containers each said virtual container having a payload section and a path overhead section;

reading identifying association data from said path overheads of said plurality of virtual containers, said association data indicating an association between individual ones of said plurality of virtual containers;

reading data bytes from each said payloads of said plurality of associated virtual containers; and

re-assembling said data from said plurality of read payload data bytes in response to said indicated association.

15. The method as claimed in claim 14, wherein said process step of reading said data bytes from said payloads comprises reading ~~a~~ plurality data bytes of said payloads in a byte interleaved manner.

16. The method as claimed in claim 14, wherein said step of identifying an association data from each of said plurality of virtual containers comprises reading a plurality of stream identification data from said plurality of virtual containers,-said stream identification data designating which of a plurality of streams of virtual containers said associated virtual containers belong to.

17. The method as claimed in claim 14, wherein said step of identifying an association data between said plurality of virtual containers comprises reading a plurality of association data comprises sequence identification data designating where in a sequence of virtual containers each an individual virtual container belongs.

18. The method as claimed in claim 14, wherein said step of receiving a plurality of said plurality of virtual containers comprises receiving a plurality of separate streams of associated virtual containers simultaneously.

19. The method as claimed in claim 14, wherein said step of reading data bytes from each payload of said plurality of associated virtual containers comprises reading said data bytes substantially in parallel from a plurality of virtual containers of a same sequence identification from a plurality of associated virtual container streams.

20. The method as claimed in claim [[14]] 16, wherein said step of receiving a plurality of said virtual containers comprises receiving a plurality of separate streams of associated virtual containers, and said step of identifying an association data from said plurality of virtual containers comprises inspecting wherein said stream identification data is read from a path trace byte of each of a plurality of said plurality of virtual containers, and distinguishing from which of a set of said streams of virtual containers said individual virtual containers belong, from said read path trace data bytes.

21. The method as claimed in claim [[14]] 7, wherein said step of receiving a plurality of virtual containers comprises receiving a plurality of separate streams of associated virtual containers, and said step of identifying an association data from said plurality of virtual containers comprises reading a plurality of sequence identification data is read designating where, in a stream of said virtual containers, a said virtual container belongs, said sequence data being read from a K3 byte of each of [[a]] said plurality of virtual containers.

22. A method of recovering data frames carried in payloads of a plurality of associated synchronous digital hierarchy virtual containers of a synchronous digital network, said method comprising the steps of:

for each said virtual container:

reading data association data from a path overhead of said virtual container, said association data indicating an association between said virtual container and other ones of said plurality of virtual containers[[;]]

allocating a memory storage area for storing a payload of said virtual container;

inputting said virtual container payload into said memory area; and

reading said data from said memory area in parallel with data read from other said memory areas corresponding to payloads of other said virtual containers ones of said plurality of virtual containers, thereby to recover said data frames.

23. The method as claimed in claim 22, wherein a said data frame is distributed between said plurality of virtual containers and said step of, for each said virtual container, reading data from said memory area in parallel with data of-other virtual containers comprises:

for each said memory area, setting a read pointer to a memory location of said memory area;

wherein said plurality of read pointers are set to said memory locations such that successive bytes of said data frame are read from said plurality of memory locations in sequence.

24. The method as claimed in claim 22, further comprising the step of assembling said data frame from said parallel read data.

25. The method as claimed in claim 22, wherein said data frames comprises an OSI layer 2 data frames.

26. A method of recovering a data block carried in payloads of a plurality of streams of payloads of a plurality of associated synchronous digital hierarchy virtual containers of a synchronous digital network, said method comprising steps of:

receiving a plurality of streams of said plurality of associated virtual containers;

reading association data from path overheads of virtual containers of each of said plurality of streams, said association data indicating an association between said plurality of virtual containers;

for each said received virtual container stream allocating a corresponding respective memory area for storage of data payloads of virtual containers of each said stream;

storing said plurality of virtual container payloads in said corresponding allocated respective memory areas in dependence on said association; and

reading individual bytes of said plurality of stored virtual container data payloads in sequence to reconstruct recover said data block.

27. The method as claimed in claim 26, wherein said step of reading individual bytes of said plurality of payloads comprises;

for each said memory area, setting a read pointer to a memory location corresponding to a next data byte of said data block to be read, contained within that data payload; and

reading said data byte once a preceding data byte of said data block has been read from a memory location of another said memory area.

28. The method as claimed in claim 26, wherein said step of reading individual bytes of said plurality of payloads comprises reading bytes from each of a plurality of said memory areas in which said virtual container payloads are stored.

29. Apparatus for recovering data from a plurality of synchronous digital hierarchy virtual containers of a synchronous digital network containing said data, said means apparatus comprising:

a random access memory configured into a plurality of individual memory areas allocated for storage of payloads of said plurality of virtual containers;

a data processor means operating to identify an read association data from path overheads of each of said virtual containers, said association data indicating an association of between said plurality of virtual containers; and

a data processor arranged to generate means for generating a plurality of read pointers for each said plurality of individual memory areas, said read pointers enabling data to be read from a operating to successively read a plurality of memory locations of said memory areas, thereby to recover said for recovering said data from said plurality of virtual containers[[.]], said read pointers being generated in dependence on said association data.

32. A method of transporting data over a synchronous digital network, said method comprising the steps of:

generating in parallel a plurality of synchronous virtual containers, each at a lower bit rate than a bit rate of said data, each said virtual container having a payload section;

associating said plurality of virtual containers with each other by means of assigning association data describing said association into said plurality of virtual containers;

indicating for each virtual container the time at which each virtual container was generated relative to other associated virtual containers;

inputting said transported data into said payloads of said plurality of virtual containers; and outputting said plurality of associated virtual containers onto a synchronous digital network,

wherein data indicating the time at which each virtual container was generated relative to other associated virtual containers is incorporated over several virtual containers by utilizing one or more bits from each successive virtual container of an association of virtual containers.

33. A method as claimed in claim 32, wherein indicating a time at which each virtual container was generated relative to other associated virtual containers is incorporated over several virtual containers by utilizing one or more bits from the payload of each successive virtual container of an association of virtual containers.

34. A method as claimed in claim 32, wherein data indicating the time at which each virtual container was generated relative to other associated virtual containers is incorporated over several virtual containers by utilizing one or more bits from the overhead each successive virtual container of an association of virtual containers.

35. A method as claimed in claim 1, wherein each association of virtual containers is identified by a path trace byte in the overhead of each of said associated virtual containers.

36. The method as claimed in claim 1, wherein data indicating the time at which each virtual container was generated relative to other associated virtual containers is provided by a sequence marker for each virtual container, and wherein the maximum differential delay expected between virtual containers at a destination in said synchronous digital network determines the number of frames over which a sequence marker must increment before it is repeated, the sequence marker being incremented every 2N+ 1 frames wherein N is the number of frames generated in a time equivalent to the maximum differential delay.

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